



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/041,148

01/07/2002

Arya Reza Behzad

BP 1983

2393

7590

05/21/2004

Timothy W. Markison  
P.O. Box 160727  
Austin, TX 78716-0727

EXAMINER

JACKSON, BLANE J

ART UNIT

PAPER NUMBER

2685

2

DATE MAILED: 05/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/041,148

Applicant(s)

BEHZAD, ARYA REZA

Examiner

Blane J Jackson

Art Unit

2685

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9-19 and 26-36 is/are allowed.
- 6) ☒ Claim(s) 1, 5, 20 and 22 is/are rejected.
- 7) ☒ Claim(s) 2-4, 6-8, 21 and 23-25 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

1. Claim 20 is rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The application of the mixer that is essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). The discussion in the Specification as correlated with figure 13 (page 13, line 29 to page 14, line 24), presumed to enable claim 20, is not clear. Other than the reference mistake of "32" for "132", the Specification relates the "input signal 32" is an RF signal for a receive signal or an IF signal for a transmit signal. The "input signal 132" of figure 13 would generally be considered a baseband signal generally well known in the art for an direct conversion I and Q type transmit system and an IF input for a receive system since it is a quadrature signal. Figure 13 shows an output signal as "IF signal 140" which may correspond to a receiver but not a transmitter. The rejection for claim 20 that follows is based on application of the applicant's mixer in the usual transceiver application as shown in Denheyer et al.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Madni et al. (U.S. Patent 6,407,632).

As to claim 1, Madni teaches a mixer comprises:

Reference current source operably coupled to produce a reference current (figure 4, the reference current source example of FET (42) and (43) shown for the Gilbert cell amplifier, column 5, line 64 to column 6, line 2),

Programmable gain radio frequency (RF) transconductance section operably coupled to convert an RF voltage into an RF current based on a gain setting signal and the reference current (figure 3: transistor quad 38-41 utilizes AGC voltage to the bases to adjust gain, the emitters receive the RF signal current from RF input to transistors 34 and 35, column 4, lines 49-65) and,

Switching quad transistors operably coupled to receive the RF current and a local oscillator voltage wherein the switching quad transistors produce a frequency translated

current (figure 3 includes added mixer section comprised of transistor quad (45-48), column 5, lines 37-58).

As to claim 5, Madni teaches the mixer of claim 1 further comprises a resistor section operably coupled to convert the frequency translated current into a frequency translated voltage (figure 3, resistors (42) and (43), column 4, lines 49-55).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Denheyer et al. (U.S. patent 5,642,378) with a view to Madni et al. (U.S. Patent 5,407,632).

As to claim 20, Denheyer teaches an intermediate frequency (IF) module comprises:

A local oscillator operably coupled to provide a local oscillation voltage (figure 2, transmit up conversion section, IQ Modulator (64) and LO (50)),

A first mixer operably coupled to mix an in-phase component of a signal with an in-phase component of the local oscillation voltage to produce an in-phase product (mixer (52)),

A second mixer operably coupled to mix a quadrature component of the signal with a quadrature component of the local oscillation voltage to produce a quadrature product (mixer (56)),

Summing module operably coupled to sum the in-phase product and the quadrature product to produce a summed signal (figure 2: I and Q signals summed in the IQ Modulator (64)) and,

Filter module operably coupled to filter the summed signal to produce an IF signal (figure 3, circuit (62) that is figure 5: bandpass filter (110), column 3, line 46 to column 4, line 5).

Denheyer does not teach internal functions of the I and Q mixers.

Madni teaches each of the first and second mixers includes:

Reference current source operably coupled to produce a reference current (figure 4, the reference current source example of FET (42) and (43) shown for the Gilbert cell amplifier, column 5, line 64 to column 6, line 2),

Programmable gain radio frequency (RF) transconductance section operably coupled to convert an RF voltage into an RF current based on a gain setting signal and the reference current (figure 3: transistor quad 38-41 utilizes AGC voltage to the bases to adjust gain, the emitters receive the RF signal current from RF input to transistors 34 and 35, column 4, lines 49-65) and,

Switching quad transistors operably coupled to receive the RF current and a local oscillator voltage wherein the switching quad transistors translate frequency of the current of the signal to produce the in-phase product and the quadrature product

respectively (figure 3 includes added mixer section comprised of transistor quad (45-48) where they may be individually used in the I and Q channels, column 5, lines 37-58).

It would have been obvious to one of ordinary skill in the art at the time of the invention to identify the mixers of the system of Denheyer with the mixer architecture taught by Madni to provide the system with the advantages of an active double balanced mixer with automatic gain control.

As to claim 22, Madni teaches each of the first and second mixers further comprises a resistor section operably coupled to convert the frequency translated current into a frequency translated voltage (figure 3, resistors (42) and (43), column 4, lines 49-55).

#### ***Allowable Subject Matter***

4. Claims 2-4, 6-8, 21 and 23-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 9-13 are allowed. As to claim 9, the prior art made of reference failed to teach a mixer that comprises switching quad native transistors operably coupled to receive the RF current and a local oscillator voltage, wherein the switching quad native transistors produce a frequency translated current such that flicker noise of the mixer is reduced and gate to body voltage of the switching quad native transistors is reduced.

Claims 14-19 and 31-36 are allowed. As to claims 14 and 31, the prior art made of reference failed to teach a mixer that comprises a common mode circuit operably coupled to provide a common mode voltage based on a common mode reference wherein the common mode circuit includes resistor section operably coupled to switching quad transistors and to the current source pair to produce the common mode reference and to convert the frequency translated current into a frequency translated voltage.

Claims 26-30 are allowed. As to claim 26, the prior art made of reference failed to teach a mixer that comprises switching quad native transistors operably coupled to receive the RF current and a local oscillator voltage, wherein the switching quad native transistors produce a frequency translated current as the in-phase produce and the quadrature product such that flicker noise of the mixer is reduced and gate to body voltage of the switching quad native transistors is reduced.

### ***Conclusion***

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sano et al. (U.S. Patent 5,884,154) discloses a mixer circuit which incorporates inductive elements in the RF transconductance circuit for low voltage applications. Wyse (U.S. Patent 6,230,001) discloses a Gilbert cell mixer where the RF input differential pair is exchanged for a transformer for low distortion, reduced

power consumption, lower noise figure and good balance. Manku et al. (U.S. Patent 6,639,447) discloses a modified Gilbert cell mixer to decrease the switching noise in the active mixer quad transistors by reducing the switching current. Kaneki et al. (U.S. Patent 6,388,502) discloses an integrated circuit with The IF output of a Gilbert cell mixer coupled to operation amplifier circuit to provide the necessary total gain where the internal mixer resistors are sized according to the supply voltage and subsequent transistor circuit requirements. Bastani et al. (U.S. Patent 6,157,822) discloses a Gilbert cell mixer where the RF transconductance amplifier is modified for a low noise figure but large power gains with low current drain. McDonald (U.S. Patent 5,196,742) discloses a low voltage mixer circuit. Souetinov et al. (U.S. Patent 6,597,899) discloses variations on the RF transconductance amplifier for an image reject mixer based on the Gilbert cell. Razavi et al. (U.S. Patent 6,606,489) discloses a differential to single ended converter with a large output swing for use with conversion circuits where the transistor may be a native device to reduce its VGS. Gu (U.S. Patent 6,631,170) discloses a radio frequency receiver where the RF is applied to an I and Q down conversion circuit with subsequent summation and filtration.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Blane J Jackson whose telephone number is (703) 305-5291. The examiner can normally be reached on Monday through Friday, 8:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on (703) 305-4385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BJJ

  
EDWARD F. URBAN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2600